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(54) CONTRACTION JOINT SEALS

(71) We, SCHLEGEL (U.K.) LIMITED, a British Company, of Ring Road, Leeds LS14 1LY, do hereby declare the invention, for which we pray that a patent may be granted to us, and the the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to highway seals and in particular to seals for contraction joints in a concrete roadway and a method of making such joints.

It is necessary, especially during the warm weather of the summer months, for contraction joints to be included in concrete roadways in order to prevent surface cracking of the concrete. These joints are normally provided at intervals of about 5 metres along the roadway and they take the form of transverse grooves or gaps extending from the surface through at least part of the thickness of the concrete slab and sealed with a deformable rubber or plastics material. Often, a strip of material is also laid on the base for the concrete slab directly below each contraction joint for the purposes of inducing a crack at this point in the concrete.

The joint may be formed either after the concrete has set or while it is still wet. In the former case, a groove is sawn in the roadway and the seal is inserted into the groove. In the latter case, the seal may be forced directly into the wet concrete by means of a vibratory blade inserting device; alternatively, a groove may be formed in the wet concrete by a blade and the seal inserted immediately thereafter. When the seals are applied to wet concrete, the surface is normally thereafter smoothed with a finisher blade.

Several types of seal are in use at the present time and each have certain disadvantages. One type of seal comprises a rigid extrusion of PVC which is inserted below the concrete surface and which has a detachable edge which, after the seal has been inserted, can be removed, the top of the joint then being filled with a mastic. The insertion of the strip at the correct distance below the surface may itself cause difficulties and because of the rigid nature of the strip, it can be displaced by the finisher blade; removal of the edge strip is also not always readily achieved and it may be necessary to drill out the joint before applying mastic. Also, as it is below the surface, concrete may find its way onto the top of the joint during the finishing process before the mastic is added and this results in spalling at the arrises.

Attempts have been made to overcome these problems by using a more flexible rubber strip bnt it has been found that the flexible strip can not be readily inserted into wet concrete because it deforms under the insertion blade and is thus incorrectly positioned. When such flexible strips are used, therefore, it has been found necessary to combine the strip with a rigid plastics insertion device. With this system the rubber strip is encased in a rigid plastic channel, the top part of which is designed to be removed after insertion so that the rubber strip expands to seal the joint. In practice, however, the rigid plastic material has proved difficult to remove without damaging the soft rubber extrusion encased within.

According to the present invention, we provide a sealing strip for contraction joints in a concrete roadway comprising a first longitudinal edge portion formed of a resiliently deformable polymeric material as a compressible sealing portion, a second longitudinal edge portion formed of a resiliently deformable polymeric material as a non-rigid substantially planar flange portion substantially thinner than said sealing portion when the latter is in an uncompressed condition, said flange portion containing stiffening means in the form of a flexible carrier for the resiliently deformable polymeric material, said carrier being stiffer than said polymeric material, so that the flange portion is substantially stiffer than said sealing portion whereby said sealing strip can be inserted into a wet concrete surface with said sealing portion in its compressed condition by driving said flange portion into said surface.

In one embodiment, the flange portion is formed of a different material from that of the sealing portions, the flange portion preferably being of semi-rigid polyvinyl chlor-

ide and the sealing portion of a synthetic rubber. The flange portion may be connected to the sealing portion by a tongue extending from said flange portion into the sealing portion and/or the flange portion may be bonded to the sealing portion.

In a preferred embodiment, the flange and sealing portions are of the same material, preferably formed as an extrusion, and the flange portion is reinforced over at least part of its length. Preferably the flange is reinforced by a wire located within the strip of elastomeric material, the wire extending in zig-zag fashion parallel to the plane of the strip and desirably extending into the seal portion as well; it is especially preferred that the bends in the wire of the zig-zag array are linked by longitudinally extending fibres to form a network. Thesse fibres are preferably knitted or woven into the zig-zag of the wire. The fibres may be cotton, but it is possible, instead of using fibres, to use wire or a monofilament.

It is especially preferred that the sealing portion comprises two hollow ribs, one on each side at the top of the flange portion. Where some reinforcement of the sealing portion is required, the hollow ribs may be adapted to receive rigid inserts, preferably of extruded polyvinyl chloride, therewithin.

The increased rigidity of the web section allows the seal to be inserted into wet concrete without the disadvantages of the prior art methods, while retaining the advantages of a resilient rubber sealing material.

The invention also provides a method for sealing contraction joints in concrete comprising inserting a sealing strip of the present invention into a concrete surface so that the flange portion extends into the concrete and the sealing uportion forms a surface seal. The strip may be inserted, either directly into wet concrete or into a preformed groove in a concrete surface so that the flange portion extends substantially vertically into the concrete surface.

Where the sealing portion of the strip comprises at least one hollow rib, the method preferably includes the further step of evacuating the said hollow rib prior to insertion of the strip so that the rib, on release of the vacuum, expands to form a tight seal in the joint.

The method may include the further step of inserting a rigid substantially rectilinear extending rod into the said hollow rib before the evacuation step.

The invention is now described with reference to the accompanying drawings in which:—

Figure 1 shows a section of one embodiment of the seal,

Figure 2 shows a detailed schematic view of a reinforcing element in the seal,

Figure 3 shows the seal of Figure 1 with strengthening inserts for the sealing portion, and

Figure 4 shows a variation of the seal of Figure 1.

Referring to Figure 1, there is indicated generally at 1 a section of a longitudinally extending strip 2 of plastics or rubber material, preferably dense Neoprene or E.P.D.M. (Ethylene propylene diene monomer rubber). The strip comprises a flange portion 3 and a sealing portion formed by two hollow ribs 4, 4^1 along one edge of the flange portion 3, one rib being provided on each side of the web portion. The strip is formed as an extension and the web portion includes a reinforcing network 5 which is shown in Figure 2 in greater detail. The web portion has longitudinally extending ribs 6 which serve to key the web portion into the concrete. As seen in Figure 2 the reinforcing network of the web in side elevation comprises a wire 7 arranged in zig-zag fashion, the bends of the wire being linked by fibres 8 of cotton yarn, or other suitable material, which is knitted or woven into the loops. The reinforced web is strong enough to be inserted directly into wet concrete and can be made so that the seal extends sufficiently far under the surface to render a base crack inducer unnecessary, thus giving a considerable saving in both time and money. The web portion also prevents longitudinal stretching of the seal in use.

If necessary, the sealing portion can itself be reinforced as shown in Figure 3 by means of rigid PVC rods 9, 9^1 inserted into the ribs $4,4^1$ before insertion of the seal.

Certain details of this embodiment of seal may, advantageously in some cases, be varied as shown in Figure 4. The web portion of this seal has angular fins 10 instead of the ribs 6 of Figure 1. Also, the top of the sealing portion is recessed, as indicated at 11. Thiis recessed portion enables the two hollow sealing ribs 4, 4^1 more readily to fold upward into a configuration substantially co-planar with the web portion to allow easier insertion into the concrete of the joint.

In a preferred method of making and sealing a contraction joint using one of the above-described seals, a vibrating blade is used to make a groove in wet concrete, the web of the seal being placed in the groove. Optionally, reinforcing rods are inserted in the ribs of the seal and the ribs are then evacuated. The vibrating blade is then used to force the seal into the groove and, when the vacuum is released, the sealing portion of the seal expands to form a tight seal between the concrete blocks.

WHAT WE CLAIM IS:—

1. A sealing strip for contraction joints in a concrete roadway comprising a first longi-

tudinal edge portion formed of a resiliently deformable polymeric material as a compressible sealing portion, a second longitudinal edge portion formed of a resiliently deformable polymeric material as a non-rigid substantially planar flange portion substantially thinner than said sealing portion when the latter is in an uncompressed condition, said flange portion containing stiffening means in the form of a flexible carrier for the resiliently deformable polymeric material, said carrier being stiffer than said polymeric material, so that the flange portion is substantially stiffer than said sealing portion whereby said sealing strip can be inserted into a wet concrete surface with said sealing portion in its compressed condition by driving said flange portion into said surface.

2. A seal as claimed in claim 1 in which both longitudinal edge portions of the strip are of the same resiliently deformable polymeric material.

3. A seal as claimed in claim 1 in which the flange portion is of a different resiliently deformable polymeric material from that of the sealing portion.

4. A seal as claimed in claim 3 wherein the flange portion is connected to the sealing portion by a tongue extending from said flange portion into the sealing portion.

5. A seal as claimed in claim 3 or claim 4 wherein the flange portion is bonded to the sealing portion.

6. A seal as claimed in any of claims 3 to 5 wherein the material of the flange portion is stiffer than that of the sealing portion.

7. A seal as claimed in claim 6 in which the flange portion is of semi-rigid polyvinylchloride.

8. A seal as claimed in any of the preceding claims wherein the stiffening means comprises a wire located within the strip and extending in zig-zag fashion parallel to the plane of the strip.

9. A seal as claimed in claim 8 wherein the wire extends into the sealing portion.

10. A seal as claimed in claim 8 or claim 9 in which the bends of the wire in the zig-zag array are linked by longitudinally extending fibres to form a network.

11. A seal as claimed in claim 10 in which the fibres are of cotton, wire or a plastics mono-filament.

12. A seal as claimed in any of the preceding claims wherein at least one rib is provided on at least one side of said flange portion.

13. A seal as claimed in any one of claims 1 to 12 in which the sealing portion is of a synthetic rubber.

14. A seal as claimed in any one of claims 1 to 13 in which the sealing portion comprises two hollow ribs, one on each side of the flange portion.

15. A seal substantially as hereinbefore described with reference to Figures 1, 2, 3 or 4 of the accompanying drawings.

16. A method of sealing contraction joints in concrete comprising inserting a strip as claimed in any one of claims 1 to 15 into a concrete surface so that the flange portion extends into the concrete and the sealing portion forms a surface seal.

17. A method as claimed in claim 16 in which the seal is inserted directly into wet concrete.

18. A method as claimed in claim 16 in which the seal is inserted into a pre-formed groove in a concrete surface.

19. A method as claimed in any one of claims 16 to 18 when using a seal including a hollow rib in the sealing portion, in which the hollow rib is evacuated prior to insertion of the seal.

20. A method as claimed in claim 19 in which a rigid rod is inserted into the hollow rib before the evacuation step.

21. A method of sealing a concrete joint substantially as hereinbefore described.

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1478963 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

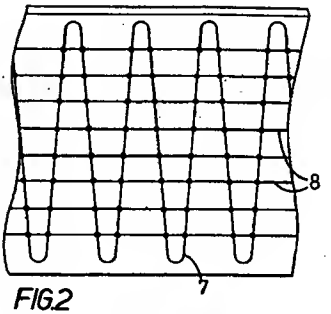

FIG.2

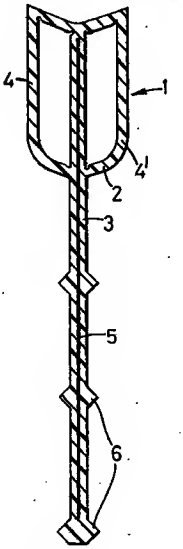

FIG.1

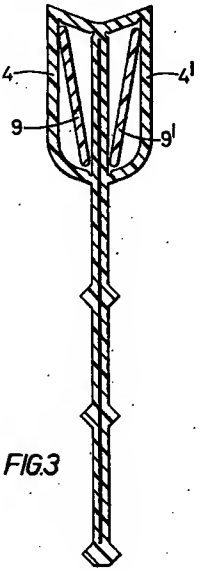

FIG.3

1478963 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 2

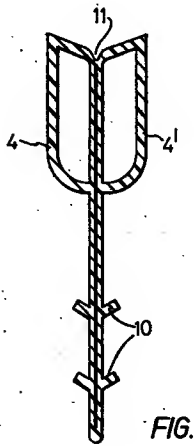

FIG.4